

# Food and Water Borne Disease Outbreaks

## Incidence of Infectious Hepatitis by State

The importance of reporting outbreaks of food- and water-borne disease has been recognized for many years. As long ago as 1912, the State and Territorial health officers recommended that the occurrence of outbreaks of certain diseases, including dysentery and typhoid fever, be reported to the Public Health Service. By 1923, the systematic collection and publication of reports of outbreaks of milk-borne disease was under way. In 1938, reports became more comprehensive and included outbreaks of illness in which water and foods as well as milk were vehicles of infection.

Prior to 1951, reports of outbreaks were collected at the end of the year, and a report was issued in annual summary form. Beginning in 1951, reports were sought on a current basis—as soon as possible after an investigation of an outbreak was completed. Since summaries of individual outbreaks have been included in weekly reports issued by the National Office of Vital Statistics, this material need not be repeated. Instead, it is summarized here in a narrative review, with three summary tables.

### Reduction in Outbreaks

Fewer disease outbreaks in which food or water was the transmitting agent were reported in 1951 than in 1950, but the number of persons affected was approximately the same. The reduction (table 1) was due almost entirely to a decrease in the number of outbreaks in which foods other than milk and milk products were the vehicles of infection.

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The number of outbreaks of water- and milk-borne disease was reduced markedly—approximately one-half and two-thirds, respectively—between 1939–41 and 1949–51, the most recent 3-year period for which figures are available. Epidemics of milk-borne typhoid fever have declined (table 2) from an average of 12 per year in 1938–40 to about one epidemic annually in the period 1949–51; outbreaks of milk-borne streptococcal infection decreased similarly. The increase in the number of local areas that require pasteurization of milk and milk products and treatment and safeguarding of water supplies undoubtedly has been instrumental in reducing disease transmission by these vehicles. On the other hand, the actual number of reported epidemics in which foods other than milk or milk products were the vehicles of infection has increased in the last decade. This probably reflects more complete reporting rather than any real increase in frequency of such outbreaks.

Faulty methods of handling food and poor hygiene on the part of food handlers were frequent findings in investigations of outbreaks of food-borne disease in which foods other than milk were the vehicles of infection, according to 1951 reports of such outbreaks. In one-third of these epidemics refrigeration was found to be either inadequate or absent, especially in outbreaks in which cream-filled pastries, meats, and salads were the vehicles of infection. Storing meats in a warming oven or steam table for several hours before serving was another practice conducive to bacterial growth. Food handlers with “sores” or dermatitis on their hands, and others having sore throat, colds, or even diarrhea, were sometimes permitted to prepare or handle easily contaminated foods.

These findings indicate very clearly that many persons operating or employed in food establishments do not appreciate the importance of proper handling of foods and of good personal hygiene in preventing food-poison and food-infection outbreaks.

### Data Analysis Difficult

Satisfactory statistical treatment or analysis of the data from reports of outbreaks of food poisoning or food infection is usually not possible. The very nature of the outbreak sometimes precludes an actual count of the persons affected, and only an estimate of their number can be reported. The interval between onset of illness and reporting of cases, as well as variation in types of investigation, is sometimes responsible for differences in completeness of reports. Samples of food served to persons ill in an outbreak of food poisoning may not have been available for laboratory testing; therefore, it would be "postulated" that the vehicle of infection was a given food which had been eaten by all, or nearly all, persons made ill and not eaten by those not ill.

Data obtained from reports of outbreaks of certain diseases represent only a fraction of the total cases of those diseases noted in routine weekly reports from the various States, while

nearly equal numbers of other diseases are reported in both weekly and outbreak reports. Apparently, efficiency of reporting mechanisms rather than an actually greater occurrence of epidemics is reflected by the larger number of outbreaks of food- and water-borne diseases reported by some States. Perhaps the medical profession in these States is more conscious of its responsibility for prompt reporting of these diseases, personnel are available for investigations, and local or city health officers work in unison with the State health officer.

Lack of appreciation of the importance of prompt reporting and investigation of all food-poison and food-infection and other common-source outbreaks, or lack of personnel and facilities for investigation would seem to be indicated by the fact that 18 States made no reports of such outbreaks in 1951. In States with small populations, perhaps no outbreaks were brought to the attention of the State health officer, but this is not a reasonable assumption for States with large populations.

### Vehicle of Infection

#### *Milk and Milk Products*

In four reported outbreaks of disease, milk apparently was the vehicle of infection. Only

**Table 1. Summary of food- and water-borne disease outbreaks reported in the United States, 1938-51**

Year	Water		Milk and milk products		Other foods		Undetermined		Total	
	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases
1938	48	31,693	42	1,685	70	2,247	8	882	168	36,507
1939	43	2,254	41	2,509	146	3,770	17	1,203	247	9,736
1940	43	44,184	43	1,678	218	5,588	18	1,088	322	52,538
1941	60	12,039	37	1,049	223	6,070	20	1,876	340	21,034
1942	53	13,271	45	2,193	245	11,420	37	1,878	380	28,762
1943	26	5,712	40	1,590	285	13,938	38	2,525	389	23,765
1944	32	2,686	41	1,449	298	14,558	22	1,683	393	20,376
1945	26	5,859	29	2,161	276	11,547	12	637	343	20,204
1946	32	4,512	19	795	299	12,526	6	312	356	18,145
1947	24	6,125	22	253	316	12,536	27	1,392	389	20,306
1948	21	619	17	613	327	9,962	10	466	375	11,660
1949	25	1,570	15	246	367	9,043	10	616	417	11,475
1950	15	1,299	10	62	347	10,174	7	564	379	12,099
1951	7	3,960	12	90	256	7,182	2	12	277	11,344

**Table 2. Summary of disease outbreaks conveyed by milk and milk products reported in the United States, 1938-51**

Year	Typhoid		Salmonellosis		Scarlet fever and septic sore throat		Food infection and food poisoning		Other		Total, all diseases	
	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases
1938-----	18	187	0	0	12	674	9	627	3	197	42	1, 685
1939-----	6	51	2	24	9	1, 324	19	749	5	361	41	2, 509
1940-----	14	120	0	0	5	482	17	855	7	221	43	1, 678
1941-----	12	120	0	0	3	219	15	483	7	227	37	1, 049
1942-----	5	42	1	4	7	620	23	1, 341	9	186	45	2, 193
1943-----	6	37	0	0	3	200	25	1, 278	6	75	40	1, 590
1944-----	8	359	1	6	2	171	23	816	7	97	41	1, 449
1945-----	3	72	0	0	3	308	18	1, 673	5	108	29	2, 161
1946-----	1	7	0	0	0	0	11	696	7	92	19	795
1947-----	3	57	1	28	0	0	16	162	2	6	22	253
1948-----	1	11	0	0	1	67	11	350	4	185	17	613
1949-----	1	7	0	0	0	0	10	218	4	21	15	246
1950-----	0	0	0	0	0	0	7	54	3	8	10	62
1951-----	1	2	4	42	1	20	4	14	2	12	12	90

36 persons were affected in these outbreaks, each caused by a different organism, *Salmonella typhosa*, *Salmonella paratyphi B*, *Streptococcus viridans*, and a staphylococcus. Raw milk was involved in three of the four outbreaks; in the fourth, pasteurized milk was used, but it was found that there had been opportunity for contamination after pasteurization. One outbreak involved 10 families, totaling 40 individuals, who were supplied from a herd of cows in which one animal was found to have an "infection" of the udder. Both hemolytic staphylococci and hemolytic streptococci were found in samples of milk from this herd. The other outbreaks are described below.

An ill-defined group of illnesses was observed in 10 children who had been drinking canned milk. The illnesses ceased when another milk product was substituted.

Ice cream was the vehicle of infection in 3 outbreaks of food poisoning in which 42 persons became ill. The infective agents in these outbreaks were, respectively, *Salmonella oranienburg*, *Salmonella typhimurium*, presumably from duck eggs, and a staphylococcus.

Raw buttermilk, from which a staphylococcus was isolated, was believed to be the source of infection in a small outbreak of illness in one family. Fruit cottage cheese, from which *E.*-

*cherichia coli* was isolated, was regarded as the vehicle of infection in another small outbreak, and in two others processed cheese caused symptoms of food poisoning.

#### Other Foods

Contaminated foods other than milk, milk products, and shellfish were the cause of nine-tenths of the common-source outbreaks of food poisoning reported in 1951 (table 3). In 53 outbreaks poultry meat and eggs were found or suspected to be the vehicle of infection. Of these, 8 proved to be caused by *Salmonella*, which suggests that the fowl or eggs were naturally infected. Processed hams, frequently precooked, were the source of infection in 38 outbreaks, nearly all of them due to a staphylococcus. Beef, usually roasted, was found to be the probable source of infection in 32 outbreaks, and miscellaneous meats in 25. Custard-filled pastries were another common vehicle of infection. There was bacteriological or epidemiological evidence that eclairs, cream puffs, cream pies, and similar types of pastry were the vehicles of infection in 34 outbreaks. Salads, fish, sandwich fillings or spreads, and creamed vegetables were suspected of being the source of infection in 34 outbreaks. In some outbreaks the exact vehicle of infection could not be de-

**Table 3. Summary of food-borne outbreaks other than milk and milk products reported in the United States, 1938-51**

Year	Botulism		Chemical food poisoning		Dysentery		Food infection and food poisoning		Typhoid and salmonellosis		Miscellaneous and unknown		Total, all diseases	
	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases	Out-breaks	Cases
1938-----	5	11	0	0	3	118	42	1, 832	17	272	3	14	70	2, 247
1939-----	9	16	0	0	2	99	122	3, 167	7	346	6	142	146	3, 770
1940-----	5	17	2	9	4	318	176	4, 983	14	136	17	125	218	5, 588
1941-----	6	20	5	78	6	443	182	5, 176	14	159	10	194	223	6, 070
1942-----	7	20	8	509	2	90	210	10, 566	8	180	10	55	245	11, 420
1943-----	4	10	3	54	7	1, 029	255	12, 436	10	227	6	182	285	13, 938
1944-----	9	29	8	105	7	939	252	12, 065	11	67	11	1, 353	298	14, 555
1945-----	12	36	6	34	3	292	233	10, 218	12	163	10	804	276	11, 547
1946-----	7	15	10	1, 484	1	40	265	9, 838	6	56	10	1, 093	299	12, 526
1947-----	12	31	6	1, 047	3	72	279	11, 023	10	215	6	148	316	12, 536
1948-----	7	30	5	74	1	120	289	8, 832	4	30	21	876	327	9, 962
1949-----	4	34	5	31	4	87	338	8, 407	3	265	13	219	367	9, 043
1950-----	3	6	4	21	1	15	310	8, 930	21	1, 173	8	29	347	10, 174
1951-----	9	20	6	31	0	0	212	6, 046	15	867	12	218	254	7, 182

terminated because the outbreaks were reported too late to be investigated, because samples of food could not be obtained, or because the investigation was not completed.

### *Shellfish*

Shellfish were regarded as the source of infection in only one outbreak. Twelve cases of an unidentified type of infection followed the eating of hard-shelled clams. Improper and unsanitary handling of the clams in a restaurant was believed to be responsible for the outbreak rather than contamination at the source of supply.

### *Water*

Bacteriological evidence of contamination or epidemiological evidence suggesting that water was the vehicle of infection was present in seven reported outbreaks of water-borne disease. In one instance, an estimated 3,500 persons in a Michigan town of 7,600 population became ill with diarrhea following a heavy rainstorm. Surface water had flooded the wells used as the public water supply. Samples of water taken 4 days after the storm showed no pathogenic organisms on bacteriological examination. Another outbreak of diarrhea followed the breakdown of chlorinating

equipment of a well-water supply used by a summer hotel. During the breakdown, water was obtained from a spring known to be an unsatisfactory source of drinking water. A third outbreak occurred in a summer camp for children, where the piping system allowed inadequate contact of lake water with chlorine, and 60 to 80 persons became ill on two different occasions. No more cases occurred after the defect was corrected. Other outbreaks included a group of 300 cases of infection among persons who had used unchlorinated water from a spring reservoir known to be unsatisfactory, and a small group of cases among persons using water from a well having a high "coliform count." There was one outbreak of 18 cases of bacillary dysentery in which the infection was traced to a well in close proximity to a pit privy.

In none of the above outbreaks was an organism of the typhoid or *Salmonella* groups found or reported.

An unusual type of water-borne disease was reported in Oregon, where 22 persons using a swimming pool developed keratoconjunctivitis. Treated river water that conformed to accepted standards of purity for drinking water and amounts of residual chlorine was used in the pool.

Two outbreaks of infectious hepatitis were reported in which water was considered to be a possible mode of transmission, but proof was lacking.

### Type of Agent

#### *Staphylococcal Food Poisoning*

In 63 outbreaks of food poisoning reported in 1951 the presence of a staphylococcus in the food was demonstrated by laboratory tests. Cream-filled pastries, mostly cream pies, cream puffs and eclairs, were the vehicles of infection in 18, or nearly one-third, of all staphylococcal food-poison outbreaks. Lack of or inadequate refrigeration was noted in 20 of the outbreaks, and in 3, the persons who prepared the food were reported to have "sores" on their hands.

Ham, usually baked, was also found to be the vehicle of infection in 27 outbreaks. In nine of these, inadequate refrigeration of the meat was noted.

In three outbreaks, milk or milk products were found to be contaminated with staphylococci. Four outbreaks were reported in which a salad was the vehicle of infection; in three of these, inadequate refrigeration was observed. Poultry meat (commonly turkey), salads containing such meat, and dressing used to stuff poultry, were reported in five staphylococcal food-poison outbreaks. A typical outbreak of this kind occurred in Wyoming. An auction sale of livestock was attended by 500 to 600 persons from three different States. Chicken salad sandwiches, prepared the day before the sale and left unrefrigerated, were served. Seventy-five persons became ill 2 to 8 hours after eating the sandwiches. On laboratory examination, *Staphylococcus aureus* was recovered from samples of this food.

A variety of meats, including roast beef, lunch meat, bologna, and pastrami, were also proved or suspected to have been the vehicles of infection in 38 outbreaks of food poisoning. Such an outbreak occurred in Connecticut following a banquet at which roast beef was served after being allowed to stand on top of a cooking range for 12 hours after roasting. An estimated 120 persons became ill, all of whom had eaten the roast beef. *Staphylococcus aureus* was found on culture of samples of the meat

and in nose cultures of 10 food handlers who had had a part in cooking and serving it.

Peas and kippered herring, respectively, appeared to be the vehicles of infection in two outbreaks of staphylococcus food poisoning, according to reports of epidemiological investigations.

#### *Typhoid Fever*

Only three outbreaks of typhoid fever were reported in 1951. In one outbreak, 30 cases and 1 death occurred in an institution in New York State with a population of 375 inmates. Onsets of illness occurred over a period of 10 weeks, January 17 to March 28. While a common source of infection was suspected—food or milk contaminated during serving—this could not be proved, nor was the source of infection traced.

In Texas, an outbreak of 12 cases followed a banquet attended by 175 persons. Neither the vehicle nor the source of infection was identified.

In Oregon, raw milk supplied by a neighborhood dairy was the source of infection in two members of one family. The operators of the dairy, a man and his wife, were found to be carriers of the same phage type of organism, namely (F-1), as that isolated from these two patients.

In addition to the 44 cases cited above, there were slightly more than 2,100 cases of typhoid fever reported in the country as a whole in 1951. Many of these may have been infected by water, milk, or other foods, the real source of infection probably being a carrier having direct or indirect contact with these vehicles of infection. However, proof that a particular food or water supply is involved is difficult to establish when only one or two cases are associated with the presence of a carrier.

#### *Salmonellosis*

Fifteen outbreaks of *Salmonella* infections, with 850 clinical cases, were reported in 1951. Eight different types of the organism were found. *S. typhimurium* was isolated in six outbreaks, *S. oranienburg* and *S. montevideo* in two each, and *S. newport*, *S. dublin*, *S. give*, *S. morgani*, and *S. paratyphi B.*, in one each.

Poultry meat or eggs were found to be the vehicle of infection in 8 of the 15 outbreaks of

*Salmonella* infection. *S. typhimurium* was found in four outbreaks. Home-made ice cream in which duck eggs were used caused illness in 30 persons; turkey eggs were an ingredient of eggnog which was found to be the vehicle of infection in another epidemic due to *S. typhimurium*.

Ten cases of milk-borne *S. paratyphi B* infection were traced to the nephew of a dairyman. For about a week just prior to the epidemic the boy had visited the dairy farm and had helped in handling the milk, which was not subject to pasteurization. In 1948 this boy had been found to be a carrier of *S. paratyphi B*, and in 1950 there was evidence that he had been the source of infection of a case of salmonellosis in his home town.

*Salmonella* infection associated with poultry meat occurred in California. Forty-one of forty-six persons became ill from 3 hours to 3 days after a pre-Christmas buffet luncheon. *S. newport* was recovered from eight of the ill persons and from portions of cold sliced turkey, sliced tongue, and potato salad. The turkeys, the tongue, and the salad ingredients had been prepared by one person and had been sliced on the same board.

Spaghetti, chopped liver, baked ham, cream filling in chocolate eclairs, and baked Alaska also appear to have been the vehicles of infection in outbreaks of salmonellosis. In some instances the type of infection was established by isolation of the organism from stools of those who were ill.

#### *Streptococcal Disease*

Milk was incriminated in only one of the eight outbreaks of illness reported due to a streptococcus. One case of mastitis was found on a farm where milk supplied to a hospital was produced and pasteurized. Infection by a food handler in the hospital was also possible.

Many varieties of food were reported to be the vehicle of infection in outbreaks of streptococcal disease, but in several instances bacteriological tests were not conclusive. Although the vehicle of infection was not identified in an explosive outbreak of 150 cases in a hospital, a dietitian had a throat culture showing streptococci and a food handler had a sore throat just before the outbreak began.

#### *Miscellaneous*

Seven outbreaks of trichinosis were reported during the year, involving 32 cases with no deaths. Poorly cooked "local" pork, home-made sausage, and ham were reported as the types of pork eaten.

A chemical was considered to be the cause of illness in six reported outbreaks of food poisoning. In five instances, exposure of soft or fruit drinks to copper vessels or utensils was regarded as the probable means of contamination.

There were two reports of mushroom poisoning in which nine persons became ill and two died. Six children mistook the roots of water hemlock for an edible plant; three of the six died.

During the year nine reports of botulism outbreaks were received. Twenty cases and 12 deaths were reported. Type A and type B botulinus toxin were identified in two instances each. Home-canned vegetables were involved in seven instances, a commercially processed cheese in one, and an undetermined vehicle in one.

Six outbreaks of gastroenteritis, involving 398 persons, were reported. In four, an organism of the paracolon group was recovered from food samples; in two, *E. coli* was isolated in large numbers. In one outbreak, 93 of 155 persons attending a meeting on milk and food sanitation became ill after eating creamed turkey. Large numbers of aerogenes-like paracolon organisms were recovered. Of the other five outbreaks, turkey meat was involved in three, roast beef in one, and fruit cottage cheese in one.

#### *Undetermined Vehicles of Infection*

Ninety-two outbreaks of illness were reported in which no determination of type of infection could be made from the details recorded. When the 92 outbreaks were grouped according to incubation period, 44 fell into the group of "suspect" staphylococcal food poisoning; 36 had incubation periods of 8 to 24 hours or longer, suggesting food infection; and in 12, the incubation period was not reported.

In many instances, no laboratory examination was possible, because all suspected foods had been eaten or left-over portions had been

disposed of before the outbreak was reported. A typical report of this kind was sent from Maine. A family of 11 persons had eaten roast capon and a salad for Christmas dinner. Twenty-one to 24 hours later 8 persons were ill, but by the time the cases were reported for investigation none of the food remained. Stools of the patients showed no pathogenic organisms.

### Other Types of Disease Outbreaks

#### *Shigellosis*

There was only one report of an outbreak of *Shigella* infection with definite evidence of transmission by food or water, and seven outbreaks were considered to be person-to-person types of infection. *Shigella sonnei* was isolated in six instances, and a flexneri type of organism in one. Four outbreaks occurred in institutions, one each in a summer camp and a school, and two were family outbreaks. In the eight out-

breaks, 381 persons were reported to have been ill, the cause of 43 of the illnesses was confirmed by a laboratory examination of stools. In one epidemic of 153 clinical cases, the exact number confirmed by a laboratory test was not given.

#### *Diarrhea of the Newborn*

Five outbreaks of diarrhea of the newborn were reported, four in New York State, and one in Illinois. Fifty-four cases with two deaths were reported. The means by which the infection was introduced were not determined in any of the five outbreaks, although in two instances contact with an infected person was considered to be the most likely mode of spread. In one small outbreak of three cases, an organism of the *Salmonella* group was isolated from the stools of one infant, and a sample of the food formula yielded an aerobic spore-bearing organism. The outbreak in Illinois was explosive in character, and occurred simultaneously with reports of transient diarrhea in the general population served by a hospital.

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## Public Health Service Appointments

Three appointments in the Public Health Service have recently been announced.

Dr. Joseph F. van Ackeren was named chief medical officer of the Coast Guard, effective October 1, 1952, to succeed Dr. Paul M. Stewart, who has retired after 37 years with the Public Health Service. Dr. van Ackeren has served as medical officer in charge of the Public Health Service Hospital, Seattle, Wash., since 1944. His previous assignments include similar positions in the Public Health Service, Out-Patient Clinic, Washington, D. C., and in the Public Health Service Hospital, Baltimore, Md.

Dr. James Payson Dixon has been appointed acting assistant director of the Public Health Service's new 500-bed Clinical Center for research at the National Institutes of Health in Bethesda, Md. He has been health commissioner for Philadelphia since January 1952, as well as serving as professor of public health and preventive medicine at the University of Pennsylvania School of Medicine.

The new chief of the bacteriology laboratory of the Communicable Disease Center, Public Health Service, is Dr. Donald S. Martin, formerly dean of the University of Puerto Rico School of Medicine. From 1932-50, Dr. Martin was on the faculty of the University of Rochester School of Medicine intermittently and on the faculty and staff of the Duke University School of Medicine and Duke Hospital. He succeeds Dr. Martin Frobisher, Jr., who has become chairman of the new department of bacteriology, University of Georgia, Athens.